

Reply to Office action of June 4, 2007

REMARKS

I. Status of the Application

Claims 16-35 are pending in this application. In the June 4, 2007 Office action, the examiner rejected claims 16-19, 21, 22, 29 and 31-33 under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 6,117,382 to Thummel (“Thummel”). In addition, the examiner rejected claims 20, 23-26, 30, 34 and 35 under 35 U.S.C. § 103(a) as allegedly being obvious over Thummel in view of U.S. patent No. 5,912,320 to Hotta et al (“Hotta”).

As set forth below, applicants respectfully traverse the examiner’s rejection of claims 16-35.

II. The Prior Art Rejections Should Be Withdrawn

In the June 4, 2007 Office action, the examiner rejected claims 16-35 as being anticipated by Thummel or rendered obvious by Thummel in view of Hotta. For the reasons discussed below, Thummel either alone or in combination with Hotta fails to teach, show or suggest each and every limitation of claims 16-35.

A. Claim 16

Claim 16 was rejected as being anticipated by Thummel. Applicant submits that Thummel does not disclose most of the limitations of claim 16. In particular, Thummel does not disclose the limitation of “attaching a first integrated circuit to a first face of a substrate . . . [and] attaching a second integrated circuit to a second face of the substrate” of claim 16. To the contrary, Thummel discloses attaching a first integrated circuit 50A

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to a surface of a first substrate 18A, and attaching a second integrated 50B to a surface of a second substrate 18B. (See Thummel, FIG. 1, and col. 5, lines 19-35). Thus, Thummel #2 teaches directly away from this limitation by specifically teaching two electronic devices 50A 50B each mounted to two completely separate substrates 18A 18B.

Thummel is directed to a method of encasing electronic components mounted on one side of a circuit board or wiring board, while leaving uncovered an array of terminals on the opposite side. According to Thummel, the method and apparatus disclosed by Thummel are applicable to any device including a generally planar substrate, wherein one side of the substrate is to be non-encapsulated in the final packaged form. Therefore, Thummel specifically teaches away from encapsulating both sides of a substrate. To speed up the production rate, Thummel teaches the use of a pair of mold plates modified from a conventional configuration so that two array packages may be simultaneously encapsulated, back to back, within a single mold cavity. By placing the packages back to back in the mold, only one side of each package (the non-abutting sides) is encapsulated leaving the abutted surfaces of each package non-encapsulated. The substrates are abutted during molding and may even be separated by a buffer member 60 to protect the array of terminals positioned on the opposite side of the substrates from the electronic components. The substrates 18A and 18B are intended to be separated after the respective electronic components have been encapsulated. Thus, the substrates 18A 18B are completely separate prior to molding, during molding and after molding. In fact the abstract refers to them as “a pair of substrate mounted electronic devices” which clearly confirms that there are two completely separate substrates. The Applicant was unable to find any portion in Thummel which teaches attaching integrated circuits to two separate

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faces of a single substrate.

Because Thummel fails to disclose the limitation of “attaching a first integrated circuit to a first face of a substrate . . . [and] attaching a second integrated circuit to a second face of the substrate,” Thummel cannot anticipate claim 16. Therefore, the rejection of claim 16 under 35 U.S.C. § 102(b) should be withdrawn.

B. Claims 17-26

Claims 17-26 depend from and incorporate all the limitations of and add further limitations to claim 16. Therefore, for at least the reasons discussed above in regard to claim 16, it is respectfully submitted that the rejection of claims 17-26 should be withdrawn as well.

In addition, it is submitted that claims 17-26 include additional reasons for patentability. For example, claim 17 includes the limitation that “the substrate includes holes extending between the first face and the second face, the encasing step includes applying the resin to a first side of the substrate and flowing the resin through the holes to the second side of the substrate, whereby the resin forms a single resin body encasing both of the integrated circuits.” Thummel does not disclose holes extending through any of surface of the substrates 18A or 18B, nor does Thummel disclose that resin flows through the holes from one side of the substrate to the second side of the substrate, and Thummel does not disclose that the first and second integrated circuits are enclosed in a single resin body.

Thummel does not disclose holes in either of the substrates 18A 18B to pass resin during molding. The buffer member 60 separates the substrates 18A 18B during molding

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to avoid any direct pressure on the array terminals and allows for variation in the thickness of the packages without adjustment of the molding machine 10. In order to satisfy the limitation of holes extending between the first face and the second face of the substrate, holes must extend through the substrates 18A and 18B from the surface of 18A upon which the electronic component 52A is mounted to the surface of 18B upon which the component 52B is mounted. The reference 60 in Thummel refers to the buffer member that is positioned between the substrates 18A and 18B. The buffer member is not part of either substrate 18A and 18B. (Thummel, col. 6, lines 40-45). Therefore, any holes which may exist in buffer member 60 do not extend to the face to which the integrated circuits are attached and certainly no resin could gain access to the buffer member 60 let alone any holes therein (otherwise the array terminals would be encapsulated as well).

In addition, as mentioned above, the substrates 18A and 18B are intended to be separated after the respective electronic components 52A and 52 have been encapsulated. The molding tool of Thummel is specifically designed so that molding material from the upper mold cavity 16A does not pass into the lower mold cavity 16B. Each mold half in Thummel includes its own runner 24, 34, and gate 26, 36. There is no disclosure in Thummel of any structure that allows mold material to pass from mold cavity 16A to mold cavity 16B so that each electronic component 52A, 52B may be encapsulated in a single resin body.

C. Claim 27

Claim 27 was rejected as being obvious over Thummel in view of Hotta. In order

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for the examiner to make a *prima facie* case of obviousness, all claim limitations must be taught or suggested by the prior art. In the present case applicant respectfully submits that the examiner has not established a *prima facie* case of obviousness, as all limitations of independent claim 27 are not taught or suggested by the prior art.

Claim 27 includes limitations similar to those found in claim 16. For example, claim 27 includes the limitation that the substrate includes contacts for attaching an integrated circuit on each side of the substrate. Therefore, the arguments presented above in connection with claim 16 are applicable to claim 27.

Furthermore, Thummel was cited as teaching all of the limitations of claim 27 except that “the substrate defines a plurality of holes extending between the first face and the second face, the plurality of holes defining voids configured to pass a resin through the substrate.” Hotta was cited as disclosing holes passing resin through a substrate. The Applicant respectfully disagrees with the examiners interpretation of Hotta. At the passage cited by the examiner (Hotta, col. 9, lines 4-11), Hotta teaches a 6-hole die, which is a steel block containing an orifice through which resin material is extruded. The die is attached to the extruder and is used to shape resin pellets to the desired form, which are then stored for later use in injection molding to encapsulating a semiconductor. A person of ordinary skill in the art would not equate an extrusion die to a semiconductor substrate. The Applicant was not able to find any portion in Hotta which referred to passing resin through a hole in a substrate during encapsulation of a semiconductor. Therefore, a combination of Thummel and Hotta would not arrive at the invention of claim 27.

Thummel, in fact, teaches against the limitation that “the substrate defines a

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plurality of holes extending between the first face and the second face, the plurality of holes defining voids configured to pass a resin through the substrate.” As mentioned above, Thummel is directed to simultaneously encapsulating two different electronic components mounted on two different substrates. The provision of holes in the substrates for passing resin therethrough would defeat the purpose of the invention disclosed in Thummel because the different substrates would be encapsulated together.

Moreover, the examiner has stated the purpose of modifying Thummel with Hotta would be “creating a resin encapsulated semiconductor device”. The Applicant disagrees this would motivate one of ordinary skill in the art at the date of invention. This purpose may motivate reading various references on resin encapsulated semiconductor devices. However, the purpose would not appear to be relevant to motivation for modifying or combining the references. To put it another way, the examiner has not provided objective evidence suggesting the desirability of combining Thummel and Hotta. Because the examiner has offered no such evidence, because the two references are related to different problems, and because a combination of Thummel and Hotta would not result in the claimed invention, the teachings of the references are not sufficient to render the claims *prima facie* obvious.

Accordingly, for at least the above reasons, Applicant submits neither Thummel nor Hotta or any valid combination thereof teaches the required limitations of claim 27. Therefore, the rejection of claim 27 under 35 U.S.C. § 103(a) should be withdrawn.

D. Claim 28

Claim 28 depends from and incorporate all the limitations of and add further

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limitations to claim 27. Therefore, for at least the reasons discussed above in regard to claim 27, it is respectfully submitted that the rejection of claim 28 should be withdrawn as well.

E. Claim 29

Claim 29 was rejected as being anticipated by Thummel. Claim 29 includes limitations similar to those found in claim 16. For example, claim 29 includes the limitation that the substrate includes an integrated circuit attached on each side of the substrate, and that the integrated circuits are encased in a resin. Therefore, the arguments presented above in connection with claims 16 and 27 are applicable to claim 29.

Accordingly, for at least those reasons set forth above in connection with claims 16 and 27, it is respectfully submitted that the rejection of claim 29 over Thummel should be withdrawn.

F. Claims 30-35

Claims 30-35 depend from and incorporate all the limitations of and add further limitations to claim 29. Therefore, for at least the reasons discussed above in regard to claim 29, it is respectfully submitted that the rejection of claims 30-35 should be withdrawn as well.

III. Conclusion

For all of the foregoing reasons, it is respectfully submitted that applicants have made a patentable contribution to the art. Favorable reconsideration and allowance of

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this application, including claims 16-35, is therefore respectfully requested.

In the event applicant has inadvertently overlooked the need for an extension of time or payment of an additional fee, the applicant conditionally petitions therefore, and authorizes any fee deficiency to be charged to deposit account 13-0014.

Respectfully submitted,



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